

Psilosoma audouini* (Zetterstedt, 1835) (Diptera: Psilidae) in Austria*C. Brückner**

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Brückner, C. *Psilosoma audouini* (Zetterstedt, 1835) (Diptera: Psilidae) in Austria. Abstract. The broadly boreo-alpine species *Psilosoma audouini* (Psilidae) is reported from the Tyrolean Oetz Valley (Ötztal) region of Austria. For the individuals observed, variation in colour and in chaetotaxy is described. A literature survey on the distribution of the species and especially on Austrian records is given. In the Fauna Europaea database, the distribution statements concerning several countries have to be revised.

Key words: Diptera, Psilidae, *Psilosoma audouini*, habitus, distribution, Austria.

Брюкнер, К. *Psilosoma audouini* (Zetterstedt, 1835) (Diptera: Psilidae) в Австрії. Резюме. Широко борео-альпійський вид *Psilosoma audouini* (Psilidae) відмічено з долини Ецталь (Ötztal) у Тиролі. Описано мінливість забарвлення та хетотаксії серед особин, що спостерігалися в природі. Подано огляд літературних відомостей про поширення виду, зокрема про знахідки в Австрії. Необхідна ревізія відомостей про поширення виду у низці країн, поданих у базі даних Fauna Europaea.

Key words: Diptera, Psilidae, *Psilosoma audouini*, морфологічні особливості, поширення, Австрія.

Брюкнер, К. *Psilosoma audouini* (Zetterstedt, 1835) (Diptera: Psilidae) в Австрії. Резюме. Широко борео-альпійський вид *Psilosoma audouini* (Psilidae) отмечен из долины Эцталь (Ötztal) в Тироле. Описана изменчивость окраски и хетотаксии среди особей, наблюдавшихся в природе. Представлен обзор литературных сведений о распространении вида, в частности, о находках в Австрии. Необходим пересмотр сведений о распространении вида в ряде стран, приводимых в базе данных Fauna Europaea.

Key words: Diptera, Psilidae, *Psilosoma audouini*, морфологические особенности, распространение, Австрия.

Introduction

The genus *Psilosoma*. In 1832 the Swedish naturalist Johan Wilhelm Zetterstedt undertook an exploring journey to Västerbotten County in the north of Sweden. Out of the vast number of collected fly specimens, he described two new species, *Scatophaga audouini* and *S. lefebvrei* (Zetterstedt 1835). Fig. 1 shows the drawing of *S. audouini* in the protologue. Some decades later he erected the genus *Psilosoma* for the two species, the type species being *P. audouini* (Zetterstedt 1860; see Hennig 1941 and Wang 1988 for more details of the history of the genus). Within the family Psilidae, *Psilosoma* belongs to subfamily Psilinae, tribe Psilini, and is close to *Psila* s. l. (Buck & Marshall 2006). In the past, some authors (e.g., Collin 1944) considered the character differences between *Psila* and *Psilosoma* too insignificant to justify two genera and

treated *Psilosoma* as a subgenus of *Psila* (see discussion in Shatalkin & Merz, 2010).

According to Hennig (1941) and Shatalkin & Merz (2010), the main characters that separate *Psilosoma* from *Psila* are:

- notopleural bristles absent, supra-alar bristles absent;
- anepimeron bare;
- male hind femora dilated and curved;
- male terminalia with long, dilated, and poorly sclerotized aedeagus;
- female ovipositor laterally compressed (cp. Fig. 6.2) and strongly sclerotized.

Morphology and colouration of *P. audouini*. The descriptions by Zetterstedt (1835, 1840), Séguy (1934), Hennig (1941), and Lindner (1973) can be summarized as follows.

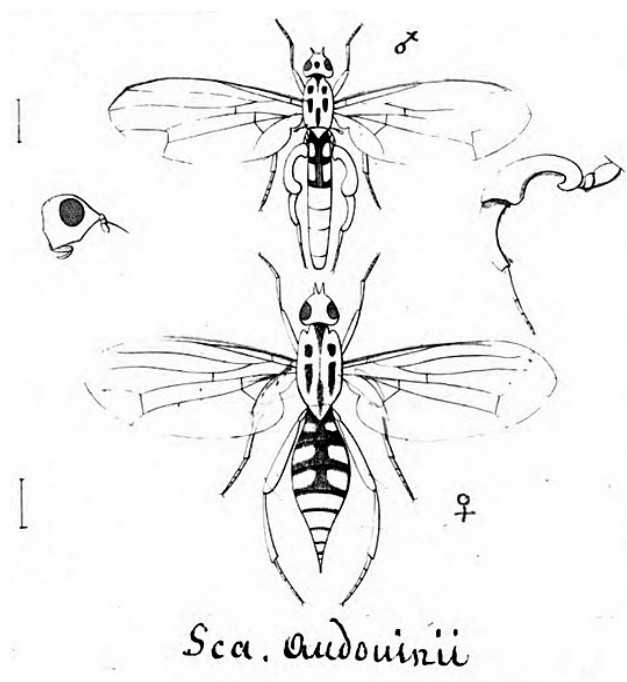


Fig. 1. Drawing (Table IV.B) in the protologue by Zetterstedt (1835), showing male and female in dorsal view, head in lateral view (left), and male hind leg in lateral view (right).

Body: slender, 5-6 mm long, shiny rusty-yellow (Fig. 2). Pubescence fine, with brass shine, especially on the thorax and the lateral parts of the tergites.

Head: Face in profile strongly retreating. Number of head bristles extremely reduced; vibrissae, orbital bristles, ocellar bristles, and postvertical bristles absent. Two pairs of vertical bristles present. Ocellar plate dark. Antennae short, arista brown, with very short hairs.

Thorax: Anterior margin of the mesonotum with a dark brown spot that is continuous with three likewise coloured, more or less extended longitudinal stripes. The lateral stripes may be reduced and not confluent with the marginal spot. The middle stripe usually dilates on the scutellum but occasionally may be distinct only on the anterior thorax. In the protologue, Zetterstedt (1835) distinguishes three colour variants based on the intensity of the dark markings. Dorsocentral bristles absent. A pair of apical scutellar bristles present. Subscutellum dark brown.

Wings: hyaline, slightly yellowish, veins yellow. Halteres whitish.

Abdomen: Zetterstedt's (1835) drawing shows different abdomen patterns in the sexes with the female being darker. Also Séguy (1934) differentiates between colour of females and of males. The female abdomen is described as dark brown with the tergite margins more or less blackened. The male abdomen is said to be reddish brown with tergites 1 and 2 completely brown and the rest with more or less brown margins, additionally a brown median line may be present.

Hennig (1941) and Lindner (1973) state a yellow abdomen with a more or less pronounced dark median line on its dorsal basis. Posterior margins of the three basal



Fig. 2. Adult imagines of *P. audouini* in lateral view. 1. Male. 2. Female.

tergites more or less darkened, in females abdomen tip dark as well.

Legs: yellow, tarsi except basitarsus brown. Femora, especially the hind ones, subapically with a dark spot or a more or less complete ring, particularly pronounced in males. Hind femora on the lower side with a small brush of dark setae below the dark area. Peculiar hind femur in males clavately thickened and arcuate, its base with a conspicuous tooth-like projection (Fig. 6.5). Hind tibiae also distinctly arcuate. In females, hind femora only slightly dilated and arcuate, without a tooth; hind tibiae hardly arcuate (Fig. 6.4).

General distribution of *P. audouini*. The Western Palearctic species occurs from Northern Scandinavia southwards to the Alps. It is associated with a cooler climate and, in the southern part of its distribution area, restricted to higher altitudes. According to Bezzi (1918, quoted by Hennig 1941), it is found in the Alps between 1,200 m and 2,300 m. Holdhaus (1912) was the first to count it among the boreo-alpine species, i.e. Pleistocene relicts with a disjunct distribution area. Whereas Lindner (1943) at first follows this classification, he later deletes the species from the list of the boreo-alpine Diptera species published in the compendium by Holdhaus (1954) and sticks to that rejection also in his book on Alpine flies (Lindner 1973). Hennig (1941) shares Lindner's opinion. The background obviously is that boreo-alpine species are defined as having a discontinuous distribution in Northern Europe and at high elevations on the Central European mountains, being absent in the intervening areas. *P. audouini*, however, occurs also in suitable habitats of low mountain ranges as, e.g., the Black Forest Mountains (Schwarzwald, Germany) or the Sudetes (Czech Republic/

Poland). Stark & Bährmann (1992/3) collected the species in the Harz Mountains, Germany, at altitudes between 820 m and 920 m. They term it a boreo-alpine species nevertheless; a „sensu lato” should better be added.

Mani (1968) points out the fact that boreo-alpine species are mostly forest forms and no tundra elements. Thus it appears that this kind of distribution only could have arisen in a Pleistocene vegetation of subarctic parkland character, i.e. woodland with interspersed meadow grounds. A comparable recent vegetation with open localities surrounded by low woody plants as well a big herbs is also preferred by *P. audouini*.

For the following countries, published records, including observations discussed in Internet forums, have been compiled below (authors' list incomplete, older literature cited in the listed papers; Austria treated separately).

Norway (Boheman in Zetterstedt 1835, 1840, Løken 1966, Global Biodiversity Information Facility 2015, distribution map by the Norwegian Biodiversity Information Centre 2015);

Sweden (Zetterstedt 1835, 1840, 1860, Holmqvist 2013, Global Biodiversity Information Facility 2015);

Finland (Winqvist 2006, Kahanpää & Stuke 2014, Global Biodiversity Information Facility 2015);

Russia: Karelia, Vorkuta (Komi Republic) (Polevoy 2003, Pennards 2010);

Germany: Northern Limestone Alps – Allgäu Alps, Wetterstein mountains; Black Forest (Schwarzwald), Bavarian Forest (Bayerischer Wald), Harz (Hennig 1941, Lindner 1943, 1973, Stark & Bährmann 1992/3);

Poland: Tatry Wysokie (Martinek 1972); Hennig (1941) mentions a find from Wrocław that, however, is situated in the lowlands;

Czech Republic: Krkonoše (Giant Mountains), Rychlebské hory, Hrubý Jeseník (Hennig 1941, Martinek 1972, 1987, Barták & Čarles-Tolrá 2009);

Slovakia: Vysoké Tatry (Martinek 1987, Barták & Čarles-Tolrá 2009);

Romania: Eastern and Southern Carpathians (Martinek 1972, Ceianu 1989);

Switzerland: Alps, e.g. Vispताल (Canton of Valais), Engadine (Canton of Graubünden) (Holdhaus 1912, Shatalkin & Merz 2010);

France: Alps — Mt. Cenis, Col du Lautaret, Rhône-Alpes — Morgins; Midi-Pyrénées region — Arrens (Holdhaus 1912, Séguay 1934);

Italia: Pennine Alps; Southern Limestone Alps - Ortler Range, Brenta Dolomites, Dolomites (Seiser Alm) (Holdhaus 1912, Hennig 1941).

Published records from Austria. The first record of *P. audouini* in Austria is cited by Schiner (1864, p. 207) in the Fauna Austriaca as follows: „Loew fing sie auf unserem Schneeberg; ich selbst habe sie noch nie erhalten können.” („Loew caught it on our Schneeberg; I myself have never got it so far.”) The Schneeberg (Snow Mountain) is part of a mountain range belonging to the Northern Limestone Alps and the highest mountain of Lower Austria, 65 km southeast of Vienna.

Holdhaus (1912) mentions another Austrian find near Bad Gastein in the Gastein Valley, today situated in the High Tauern National Park. The High Tauern mountain range is included in the Central Eastern Alps. Lindner (1973) adds the Lechtal Alps, a part of the Northern Limestone Alps and close to the Allgäu Alps that are located mainly in Germany.

The most recent publication of a find is by Kofler & Chvála (2015). They studied the Empidoidea of East Tyrol, District of Lienz, in the Eastern Alps, and in 1994 caught in the Lienz Dolomites a copulating couple of *Empis (Anacrostichus) bistortae* Meigen, 1822 with *P. audouini* as a prey (nuptial gift).

Material and methods

In August 2010, 2013, and 2014 *P. audouini* was observed around the village Niederthai (part of the municipality Umhausen, district of Imst), situated in the East Tyrolean Oetztal region on a plateau of 1,500 m. The flies were seen in woodland habitats along rides in dappled sunshine (Fig. 3). They proved to be philopatric and were



Fig. 3. Habitat of *P. audouini* about 2,100 m northeast of Niederthai (ca. 1,730 m, ca. 47.138475 °N 10.989998 °E).
1. Partially shaded ride in conifer woodland. 2. Low vegetation along ride edge.

found exactly in the same place every year. Though they are said to occur preferably in stands of *Alnus viridis* (Lindner 1943, Shatalkin & Merz, 2010), they were usually not observed on the foliage of green alders, but on medium-sized (sub)shrubs (e.g. *Rubus idaeus*) and tall broad-leaved herbs. A total of 6 males and 14 females were seen, moving slowly over the leaves and sucking up liquefied food.

Photographs were taken with a digital bridge camera Canon Powershot S5 IS, equipped with a Raynox DCR-150 macroscopic lens. The internal flash was used to enable a fast shutter speed, as the camera was handheld without using a tripod. This explains for the rather low quality of some photographs that were initially not intended to be published.

No specimens were collected.

Results

Colouration. A thorough examination of the photo series revealed a remarkable variation in body colouring, so that each individual was easily recognizable by its markings. As the description given above is rather general, some details will be added to cover the whole range of colour patterns observed.

Head: Colouration is basically yellow, the vertex usually being distinctly darker than the frons (Fig. 7.1). The occiput displays dark brown to black markings that are not paid attention to in the literature. Some colouration patterns are schematically depicted in Fig. 4. The ocellar triangle rarely is yellow in light-coloured individuals, in darker ones it is usually brown to black, especially if included in a black spot extending from the occiput.

Thorax: As already pointed out in the protologue by Zetterstedt (1835), there is a high degree of variability in colouration. The dark stripes differ considerably in length, width, and intensity. They have no common origin at the anterior margin of the convex mesonotum. The lateral markings appear at a higher level than the median stripe and may be continuous or show a disruption at the transverse suture. Their parts in the presutural area may be lighter coloured or lacking. The median stripe may be broad and of equal width throughout, abruptly narrowed

in the postsutural area, narrow throughout, or hardly recognizable in light-coloured forms. In the latter also the scutellum is yellow, otherwise its centre is dark to a greater or lesser extent. Fig. 5 shows schematically several variants of thorax markings.

Abdomen: The mode of colouration is not confined to one sex. In both sexes darker and lighter abdomina occur, the female terminalia are, however, darkened (Fig. 6.3). The median colouration of the basal tergites is usually hidden under the folded wings, its variability can be but roughly estimated. The markings on the narrow male abdomina seem to consist of a serrated median line but hardly show through the wings. Fig. 6.1 depicts a grooming female, the abdomen of which has a dark median line that is confluent with the darkened median parts of the hind margins of two tergites and tapers towards the terminalia. The dark dorsal area varies in extent and intensity. Rarely, the basal tergites seem to be completely dark. Sometimes a broad cuneate spot tapers towards the middle of the abdomen.

Legs: Beside the pronounced dark spot that is present subapically on the hind femora, less dark spots can be found on the dorsal surface of the middle femora and, occasionally, the fore femora. The dorsal surface of the tibiae, particularly the hind ones, may be distinctly darkened on at least the apical half (Fig. 6.2). One individual showed extensive darkening of all tibiae, combined with rather dark tarsi including the basitarsi. The above statement „legs yellow” is thus too narrow.

Chaetotaxy. All observed individuals have two pairs of vertical bristles that insert well behind the eyes (Fig. 7.1). In rare cases, short ocellar setae might be present; however, the insufficient magnification of the pictures renders a sure identification impossible. Hennig (1941) states that the ocellar bristles of *P. audouini* are „extraordinarily weak”, whereas Lindner (1973) declares them absent. Collecting would be needed to reveal if there might be a certain amount of specimens showing reduced ocellar bristles.

All photographed individuals possess a pair of postalar bristles (Fig. 7.2). Their presence is not mentioned in the literature; however, Hennig (1941) describes them for the second species of the genus, *P. lefebvrei* Zetterstedt, 1835. Thus, postalar bristles seem to be a genus character.

The scutellum usually bears a pair of apical bristles (Fig. 7.2), in rare cases one bristle was less developed

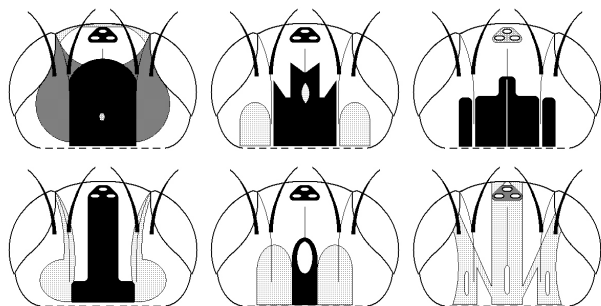


Fig. 4. Schematic illustration of occiput patterns. Colour intensity is indicated by different hatching.

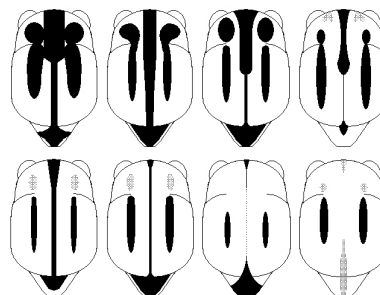


Fig. 5. Schematic illustration of thorax patterns. Colour intensity is indicated by different hatching.

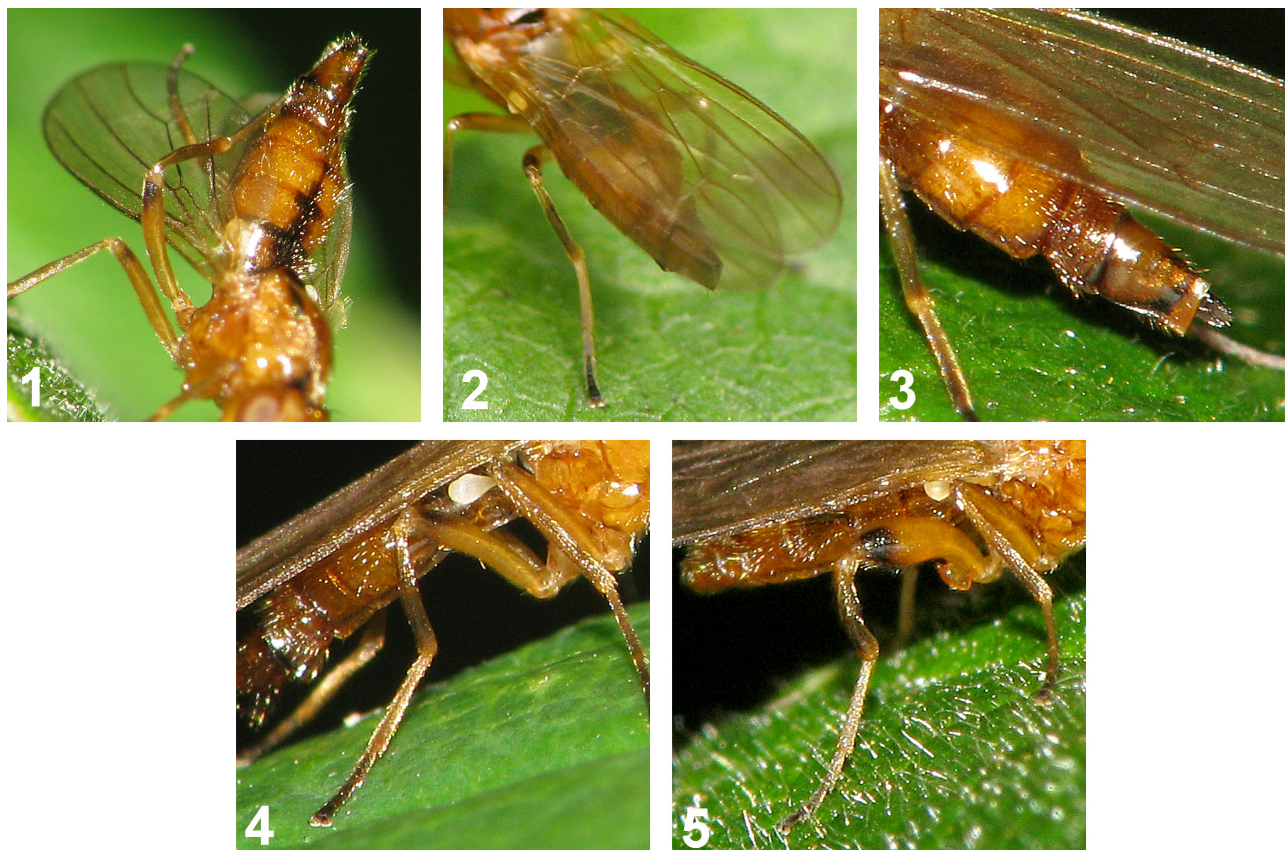


Fig. 6. Body details, 1–4: ♀, 5: ♂. 1. Abdomen in dorsal view with dark median markings. 2. Laterally compressed terminalia; darkened hind tibia. 3. Dark-coloured terminalia. 4. Typical female hind leg. 5. Typical male hind leg showing arcuate, clavate femur with tooth-like outgrowth, and arcuate tibia.

or lacking. Two males with a bristleless scutellum were seen (Fig. 7.4), but the presence of two protruding „scars” indicates that the bristles obviously were broken. A female showed an additional scutellar bristle (Fig. 7.3) with no trace of the second pair member. This exceptional case recalls other members of the Psilidae with two well-developed pairs of scutellars.

A male showed an additional, seemingly likewise unpaired, thorax bristle (Fig. 7.5 a, b) in the position of a dorsocentral. As *P. lefebvrei* possesses a pair of dorsocentrals in comparable position, the occurrence of similar bristles in *P. audouini* might be interpreted as an ephemeral reversal. Uneven numbers of dorsocentrals have been described for another psilid genus, *Chamaepsila*, by Wang (1988), who regards variation in bristle number as a character of but minor importance.

Conclusions

P. audouini seems to be a frequent high-altitude species in Austria. There is a considerable degree of intraspecific variability observable, the range of which should be substantiated by collected specimens. Whereas additional thorax bristles are occasional phenomena, the variation in the dark markings of occiput and especially thorax seems to be typical. The colour of legs and tarsi varies gradually.

Within the genus, the only species that could be confused with *P. audouini* is *P. lefebvrei*, which is said to occur in the same habitats but was not observed by the present author. According to Zetterstedt (1835, 1840), Séguy (1934, under the synonym *Camptopsila lefebvrei*), and Hennig (1941), its body is uniformly rusty-yellow without any dark markings. Only the ocellar plate is said to be black, but the photograph by Vikhrev (2006) clearly shows that it may be yellow as well. A specimen with any sign of dark thoracic markings should thus undoubtedly belong to *P. audouini*. Furthermore, species discrimination is facilitated by chaetotaxy: *P. lefebvrei* possesses a pair of orbital bristles and a pair of dorsocentrals that both lack in *P. audouini*. The hind femora of the males are thickened, but not clavate, and lack the tooth-like projection. This combination of characters enables a safe discrimination of the two species in the field.

The distribution table for *P. audouini* (Pape & Beuk, 2013) given in the web database Fauna Europaea lists the following countries only: Czech Republic, Germany, Italian mainland, Slovakia, Switzerland. Even the terra typica Sweden (Lapland region) is not quoted. Therefore, necessary additions concern French mainland, Finland, Norwegian mainland, Poland, Romania, European Russia North and Northwest, and Sweden.

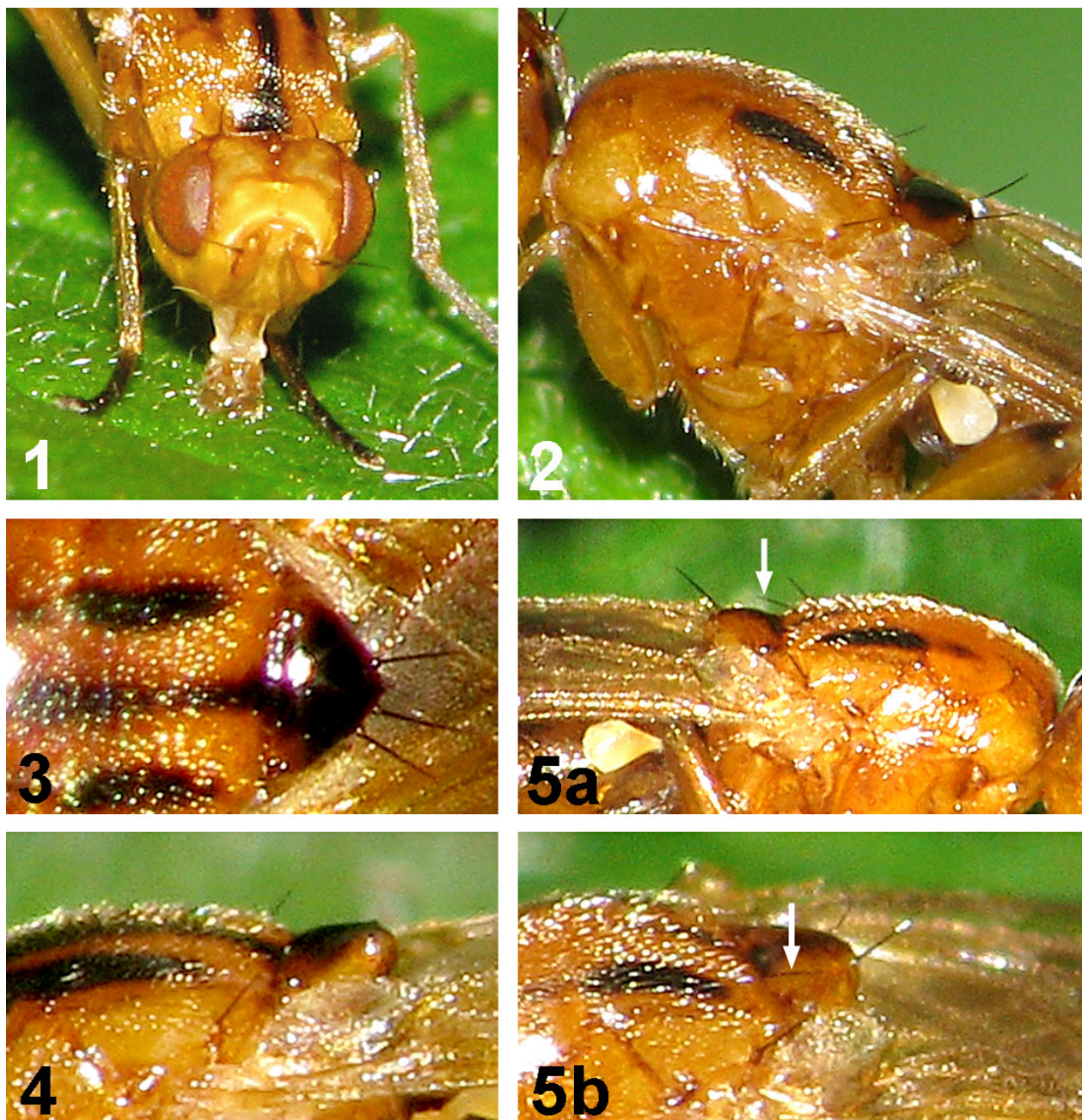


Fig. 7. Chaetotaxy, 1–3: ♀, 4–5: ♂. 1. Head in frontal view, two pairs of vertical bristles. 2. Thorax in lateral view, showing two postalar bristles and two apical scutellar bristles. 3. Scutellum with an additional subapical bristle. 4. Scutellum without bristles (these possibly broken). 5a,b. Additional single dorsocentral bristle (arrow).

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